2012 Annual Report on Implementation of the 2000 Consent Decree for 1836 Treaty-Ceded Waters of the Great Lakes

Prepared for:

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By:

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Preface

This report provides detailed information regarding the implementation of the 2000 Consent Decree in the 1836 Treaty-ceded waters of the Great Lakes during 2012, as required by the September 27, 2001 Memorandum of Understanding between the State of Michigan, Department of Natural Resources (MDNR) and the Michigan United Conservation Clubs, Inc., Michigan Fisheries Resource Conservation Coalition, and Bay de Noc Great Lakes Sportfishermen, Inc.

FISHERIES

I. General Information

A. Large-mesh gill net retirement

In an effort to reduce the amount of large-mesh gill net fished by tribal fishers, the Consent Decree called for the Sault Ste. Marie Tribe to remove at least 14 million feet of large-mesh gill-net effort from lakes Michigan and Huron by 2003. Removal of large-mesh gill-net effort by other tribes also counted towards this commitment. The amount of gill net retired is based on comparison with the average effort during the base years 1993 through 1998 (Table 1). Gill-net retirement has been accomplished through the trap-net conversion program and other methods.

The removal of large-mesh gill-net effort in lakes Huron and Michigan was successfully completed by 2003 when tribal fishers used approximately 25.5 million feet less than the 1993-1998 average. Large-mesh gill-net effort has increased since then; however, in 2012 the tribal gill-net effort in lakes Michigan and Huron was still approximately 12.3 million feet less than the 1993-1998 average (Table 1). In Lake Superior a new fishing operation moved into MI-6 in 2012, which resulted in higher gill-net effort as compared to the 1993-1998 average. For all three lakes, approximately 17.1 million feet less effort was fished in 2012 compared to the 1993-1998 average.

Table 1. Amount of large-mesh gill-net effort (1,000s ft) in the 1836 Treaty-ceded waters of the Great Lakes during base years 1993 to 1998 and projected effort in 2012.

Lake	Management Unit	Effort		2012 reduction[b]
		1993-98[a]	2012	
Michigan	MM-123	17,912	13,713	4,199
	MM-4	1,794	857	937
	MM-5	240	17	223
Huron	MH-1	16,470	9,517	6,953
	MH-2	6	0	6
Superior	MI-6	780	1,381	0 (601 increase)
	MI-7	2,028	710	1,318
	MI-8	6,578	2,506	4,072
Totals		45,808	28,701	17,107

[a] Average annual effort during base years.
[b] The relative reduction in 2012 (average effort in base years minus effort in current year).

B. Report from Modeling Subcommittee and modeling process description

The Modeling Subcommittee (MSC) of the Technical Fisheries Committee (TFC) prepares an annual report entitled "Status of Lake Trout and Lake Whitefish Populations in the 1836 Treaty-Ceded Waters of Lakes Superior, Huron, and Michigan, with Recommended Yield and Effort Levels" (referred to as the Status of the Stocks Report). The report detailing populations and harvest limits for fishing year 2012 was completed in December 2012. This and all previous versions are available on the 2000 Consent Decree page of the MDNR's Tribal Coordination Unit website: http://www.michigan.gov/greatlakesconsentdecree**.** The MSC recommended to the TFC that the format of this report be changed beginning in 2013. The TFC approved changes that will streamline the report, eliminate some duplicative information, and allow the report to be completed in a shorter frame of time. The 2013 version of this report should be posted to the above website in late summer 2013.

Statistical catch-at-age (SCAA) models are used to describe populations of lake trout and lake whitefish and to recommend the respective harvest limits. The modeling process begins by estimating parameters that describe each of the lake trout and lake whitefish stocks over time. Models are developed for the stocks in each defined Management Unit with data from both standard assessments and commercial and recreational fisheries. Age-specific abundance and mortality rates are estimated for each year that data are available. All models are tested for accuracy by comparing predictions to actual observations. The agreement between predictions and observations is measured by statistical likelihood. The set of parameters that gives the maximum likelihood (highest agreement) is used as the best estimate. After parameters are estimated, the fish population is projected forward through the next fishing season in order to make short-term projections of harvest and yield that will meet criteria, such as target mortality rates and spawning stock biomass, set forth in the Consent Decree.

All fish populations are regulated by three key rates: growth, mortality, and recruitment. These are each estimated in the first stage of the modeling process and then incorporated into the projection models. Growth is described using mean length at age, which is fit to a nonlinear regression model based on the fact that growth slows as fish approach a maximum size. Mortality is estimated from age structure data by examining the decline in catch at age across age classes. Generally, there is a steady decline in the relative abundance of successive age classes over time. Total mortality is comprised of fishing and natural mortality. Fishing mortality includes recreational, subsistence, and commercial harvest, as well as mortality of fish returned to the water due to hooking and netting injuries. Harvest is monitored annually for each user group through direct reporting, wholesale fish reports, charter boat reports, and creel surveys. Models incorporate an estimate of hooking mortality for lake trout derived from a 1980s study in Lake Superior. The value currently used is 15%, but research is ongoing in both Lake Huron and Lake Superior to update this value. Natural mortality is comprised of losses due to old age, disease, and predation. Natural mortality is estimated from an equation that relates the growth parameters of lake trout and lake whitefish to water temperature. Additionally, sea lamprey mortality is calculated from wounds observed during assessments, along with the estimated probability of surviving an attack. Finally, recruitment is the process of reproduction and growth to a certain size class that is beyond the initial period of high mortality. Recruitment may also imply the entry into a fishery of individuals of legal size for harvest. Most exploited fisheries demonstrate variable recruitment due to an assortment of abiotic or biotic conditions. Recruitment variability is measured by assessing the relative abundance of a single age class using a standard effort, location, and time of year. For example, managers may use the relative abundance of age-3 fish in spring gill-net surveys as an index of year-class strength. In the case of a fishery that relies almost entirely on stocking (e.g., lake trout in Lake Michigan), recruitment is essentially known.

In order to describe the dynamics of a population over time, modelers specify the initial numbers of fish at each age in the first year and recruitment of the youngest age in subsequent years. Currently, in lakes Michigan and Huron, lake trout recruitment is defined as the number of yearlings stocked or migrating into an area less those migrating out of the area. However, natural reproduction of lake trout in Lake Huron has increased in recent years, and that recruitment will need to be specifically accounted for in the coming years. For wild lake trout (Lake Superior) and lake whitefish (all management units), recruitment is estimated from a Ricker stock-recruit function. In general, a stock-recruit relationship describes how the number of young fish (recruits) relates to the number of spawners that produced them.

After parameters have been estimated, the next step is the short-term projection of harvest limits. Harvest levels are set in order to not exceed target mortality rates set forth in the Consent Decree and are derived by applying various fishing mortality rates to the population abundance estimated at the start of the year. Target mortality rates are comprised of an assortment of age-specific mortality rates. Additionally, the target mortality rates are defined by taking into consideration the concept of spawning stock biomass per recruit, or the amount of spawning biomass that an average recruit is expected to produce. This provision ensures that there is an adequate amount of spawning stock per recruit and that more than one age class is contributing considerably to the spawning population. A more extensive and technical description of the entire modeling process is contained in the *Stock Assessment Models* section of the Status of the Stocks Reports.

C. Model estimates used during negotiation

During the final stages of negotiations in 1999, model estimates of harvest limits and total allowable effort were projected under likely scenarios for the commercial and recreational fisheries over the life of the Consent Decree. For lake trout, the projections are separated into a phase-in period (where applicable), and rehabilitation period or sustainable management period. Phase-in periods are intended to allow for a more gradual transition to target mortality rates and final allocation percentages. For comparison, a reference period is also included for each Management Unit. Information regarding the lake trout fishery is detailed by Management Unit in Appendix 1. Information regarding the whitefish fishery is detailed by whitefish Management Unit in Appendix 2.

II. Harvest Limits and TAE's (Total Allowable Effort)

A. Lake trout

As required by the Consent Decree, the MSC calculates annual harvest and effort limits for lake trout and provides these recommendations to the TFC. After reviewing the recommendations, the TFC must approve harvest and effort limits by April 30 of each year to be submitted to the Parties for final approval. In 2012, stipulations to the Consent Decree set harvest limits in MM-123 and MM-4. These stipulations have been in place for more than 5 years and are the result of high levels of lamprey-induced mortality on lake trout, which would otherwise severely restrict all lake trout fishing.

The Consent Decree has a provision that harvest limits in fully-phased units should not change by more than 15% over the previous year unless all the Parties agree a greater change is appropriate. In 2012, this rule was only applied in MI-6. Changes to the model structure made some Parties uncomfortable with the magnitude of the model's increase in recommended harvest limit, and the limit was set 15% higher than the 2011 value. In MH-1, the Parties set a harvest limit that differed from the model, but the 15% rule did not yet apply, as the unit became fully-phased in 2012. After negotiating, the TFC reached consensus on recommending a total harvest limit of 410,000 pounds. The MH-1 model structure was changed in late 2011 and early 2012 to reflect the increasing proportions of wild lake trout showing up in catches both by fishermen and survey crews. The model had other structureal updates to improve performance, and the cumulative impact of those changes was a harvest limit substantially higher than past years. Some parties were uncomfortable with the magnitude of the increase; therefore, a limit lower than the model recommendation was negotiatied for 2012. A map of the lake trout management units is provided at the end of this document (Figure 1), and the 2012 lake trout harvest and effort limits for each management unit are below in Table 2.

Table 2. Model estimates of harvest limits (HL; pounds) and total allowable effort (TAE; linear feet of gill net) for lake trout by management unit in 1836 Treaty-ceded waters of the Great Lakes for the 2012 fishing season.

		Model-output HLs		Final HLs		
Lake	Unit	State	Tribal	State	Tribal	Tribal TAE
Michigan	MM-123[a]	0	0	50,000	453,000	14,950,000
	MM-4[a]	41,870	51,174	77,200	99,977	1,130,000
	MM-5	61,054	40,740	61,054	40,740	297,000
	MM-67	394,844	43,871	394,844	43,871	NA
Huron	MH-1	62,312	455,479	49,200	360,800	11,752,000
	MH-2	168,464	8,871	168,464	8,871	NA
Superior	MI-5	135,555	7,134	135,555	7,134	NA
	MI-6 [b]	88,058	88,058	68,064	68,064	3,740,000
	MI-7	21,422	49,985	21,422	49,985	3,105,000

[a] Final HLs resulted from orders to amend the Consent Decree.
[b] TFC invoked the 15% rule, limiting the HL to a 15% deviation from the 2011 harvest limit.

B. Lake Whitefish

As required by the Consent Decree, the MSC calculates annual lake whitefish harvest limits for shared management units, and provides these recommendations to the TFC. For each whitefish management unit that is not shared, the Tribes set a harvest regulation guideline (HRG) in accordance with their Tribal Management Plan. The MSC also generates recommendations for HRGs that are considered by each Tribe. After reviewing and discussing recommended harvest limits for lake whitefish, the TFC submits these harvest limits to the Parties for final approval by December 1 for the subsequent year. The TFC reached consensus on harvest limits for all shared whitefish management units, and these figures were sent to the Parties in December 2011. A map of lake whitefish management units is provided at the end of this document (Figure 2), and the 2012 lake whitefish harvest limits for each management unit are below in Table 3.

The MSC was able to generate model recommended harvest limits in all shared units and most non-shared units. The Leland/Frankfort unit (WFM-06) maintained its constant harvest limit which was first established in 2011. In non-shared units with HRGs, the process of modeling all of Northern Lake Huron as one unit, which began in 2010, continued in 2012. Individual HRGs were not set for the four individual units in Northern Lake Huron, but the model output was considered and a single HRG was set for the newly created management unit. The final tribal HRG in this unit was set higher than the model, as the tribes were concerned with the magnitude of the model reduction; however, the adopted HRG was 25% lower than the 2011 value. In two other non-shared management units, the MSC could not calculate a recommended harvest limit using SCAA models. In WFM-07 there continues to be an insufficient time series of data. In 2004, the HRG for WFM-07 was set at 500,000 lb, which represented the approximate average of the model-generated harvest limits from adjacent units WFM-06 and WFM-08, and no changes have been made since. In unit WFS-06 a lack of commercial catch sampling has resulted in poor model performance; thus, the 2012 HRG was again set at 210,000 lb, the same level it has been since 2004. In WFM-02 the 2012 HRG was set at peak historical harvest, which is lower than the model output. The Tribes accepted model-generated recommendations for HRGs in other units.

Table 3. Model estimates for harvest limits (HL; pounds) or harvest regulation guidelines (HRG; pounds) for lake whitefish by management unit in 1836 Treaty-ceded waters of the Great Lakes for the 2012 fishing season.

Lake	Unit	Final State HL	Model output Tribal HL	Final Tribal HL or HRG
Michigan	WFM-01	200,000	3,874,600	3,874,600
	WFM-02	-	800,900	558,000
	WFM-03	-	2,219,400	2,219,400
	WFM-04	-	678,000	678,000
	WFM-05	-	396,000	396,000
	WFM-06	65,000	-	145,000
	WFM-07[a]	-	-	500,000
	WFM-08	500,000	1,128,400	1,128,400
Huron	(H01-H04 Combined)		431,600	539,700
	WFH-05	-	787,800	787,800
Superior	WFS-04	9,600	86,400	86,400
	WFS-05	84,500	443,500	443,500
	WFS-06[a]	-	-	210,000
	WFS-07	-	420,200	420,200
	WFS-08	-	242,000	242,000

[a] No model output

III. Harvest and Effort Reporting

A. State-licensed commercial and recreational fishing

1. Lake Trout

Lake trout harvest by the State of Michigan consists entirely of harvest by sport anglers. The harvest limits and reported harvest in Lake Superior represent lean lake trout only. Throwback mortality from the state recreational fishery (lake trout caught by hook and line that are returned to the water and subsequently die) was estimated for each management unit. These fish were added to the number and weight of lake trout harvested in the recreational fishery (Table 4). Lake trout harvest by state-licensed recreational fishers in 2012 was below harvest limits in all management units. Because of higher quotas in Lake Huron, MDNR was able to simplify size regulations in Lake Huron, making them consistent between MH-1, MH-2, and the remainder of the lake. Estimated State-licensed recreational harvest of walleye, yellow perch, and Chinook and Coho salmon are also listed below in Table 4, as is total effort for all species combined. The Consent Decree does not require harvest limits to be set for these species.

Table 4. Total effort, number, and weight (pounds) of estimated State-licensed recreational harvest for both creel and charter anglers, by lake trout management unit in 1836 Treaty-ceded waters of the Great Lakes for the 2012 fishing season.

Lake	Management Unit	Total effort (angler hours)	Lake trout[a]		Walleye		Yellow perch		Chinook salmon		Coho salmon	
			Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
Michigan	MM-123	400,820	3,016	16,348	10,830	23,393	66,156	21,831	28,149	300,350	8,667	34,408
	MM-4	142,299	14,646	70,847	0	0	881	282	10,053	115,207	549	2,564
	MM-5	193,209	1,851	12,852	0	0	5	2	42,593	417,411	2,946	13,758
	MM-67	793,080	5,595	37,989	26	56	14,779	4,286	130,665	1,327,556	12,726	57,394
Totals		1,529,408	25,108	138,036	10,856	23,449	81,821	26,401	211,460	2,160,524	24,888	108,124
Huron	MH-1	249,898	3,876	21,231	5,275	12,977	184,769	81,298	7,267	60,171	376	1,203
	MH-2	73,441	3,344	26,004	4,446	15,383	7,672	3,377	1,424	11,833	149	700
Totals		323,339	7,220	47,235	9,721	28,360	192,441	84,675	8,691	72,004	525	1,903
Superior	MI-5[b]	30,463	7,710	28,285	0	0	0	0	124	698	1,317	2,384
	MI-6	31,676	5,255	20,389	0	0	506	268	234	987	2,619	4,217
	MI-7	15,561	1,711	5,176	0	0	0	0	5	21	654	1,249
Totals		77,700	14,676	53,850	0	0	506	268	363	1706	4,590	7,850
Grand totals		1,930,447	47,004	239,121	20,577	51,809	274,768	111,344	220,514	2,234,234	30,003	117,877

[a] Lake Superior lake trout number and weight do not include Siscowets; number of Siscowet harvested was estimated at 31, 377, and 470 fish, for MI-5, MI-6, and MI-7, respectively.

[b] Includes recreational harvest from entire unit; harvest from 1842 Treaty-ceded area was not removed.

2. Lake Whitefish

Lake whitefish harvest by state-licensed commercial fishers was below harvest limits in all whitefish management units. The commercial whitefish harvest reported in Table 5 includes catch from targeted effort (trap nets). Catch of lake whitefish in chub nets is minimal most years and was zero pounds for 2012.

The largest monitored recreational fishery for whitefish has typically occurred in unit WFM-05 (Grand Traverse Bay area). In 2011, the recreational harvest from Grand Marais (WFS-06) exceeded that from Grand Traverse Bay, and that pattern continued in 2012 as the Grand Marais harvest increased and Grand Traverse Bay harvest decreased. Recreational harvest of whitefish in Grand Traverse Bay was estimated to be 882 fish in Grand Traverse Bay, but 10,716 fish in Grand Marais. The other area where recreational harvest of whitefish is common is Munising, where 1,310 fish were harvested in 2012. The State does not estimate targeted recreational effort for lake whitefish in these management units.

Table 5. Summary of state-licensed commercial lake whitefish harvest (pounds) and effort (trap-net lifts) by lake whitefish management unit in 1836 Treaty-ceded waters of the Great Lakes for the 2012 fishing season.

Lake	Unit	Harvest	Effort
Michigan	WFM-01	158,919	297
	WFM-06	24,852	126
	WFM-08	178,323	391
Lake totals		362,094	814
Superior	WFS-04	100	2
	WFS-05	79,389	362
Lake totals		79,489	364
Grand totals		441,583	1,178

B. Tribal commercial and subsistence fishing

Data in this section are as reported to the MDNR from the Chippewa Ottawa Resource Authority (CORA). At the time this report was completed, CORA had not finalized harvest data for 2012; thus, all reported numbers are considered preliminary. It is unknown how much these preliminary numbers will change when they are made final. Historically, whitefish numbers have changed more often and by a greater margin than numbers for lake trout or other species.

1. Lake trout

According to preliminary harvest reports, in 2012 lake trout harvest by tribal commercial fishers was below established harvest limits in all management units. Lake trout are most commonly harvested by tribal commercial fishers as bycatch in the lake whitefish fishery; thus, effort is not reported in Table 6 (see Table 7). The Tribes estimated the throwback mortality from trap and gill nets in MH-1 where bag limit regulations apply. In 2012, the lake trout daily bag limit for gill-net fishers in MH-1 increased from 500 lb per day to 600 lb per day. In addition, non-converstion trap-net fishers were allowed to retain 100 lb of lake trout each day. These changed took effect May 31, 2012.

Table 6. Summary of preliminary tribal commercial lake trout harvest (pounds) by management unit in 1836 Treaty-ceded waters of the Great Lakes for the 2012 fishing season. Gill-net harvest includes that from small-mesh and large-mesh gill nets.

Lake	Unit	Trap-net harvest	Gill-net harvest	Total harvest
Michigan	MM-123	13,790	341,996	355,786
	MM-4	190	97,127	97,317
	MM-5	6,944	6,943	13,887
	MM-67	2,380	0	2,380
Lake total		23,304	446,066	469,370
Huron	MH-1[a]	9,121	261,185	270,306
	MH-2	0	0	0
Lake total		9,121	261,185	270,306
Superior	MI-5	0	0	0
	MI-6	0	45,134	45,134
	MI-7	0	10,316	10,316
	MI-8	3,456	52,417	55,873
Lake total		3,456	107,867	111,323
Grand total		35,881	815,118	850,999

[a] Includes estimated throwback mortality of 5,133 lb.

2. Lake Whitefish

Lake whitefish harvest by Tribal commercial fishers was below the approved harvest limits and HRGs in all management units. In management units that are not shared, the Tribes manage the fishery in accordance with the Tribal Plan and no penalty is incurred for overharvest. In shared whitefish management zones, overharvest penalties are incurred when a party exceeds the harvest limit by greater than 25%.

Table 7. Summary of preliminary tribal commercial lake whitefish harvest (pounds) and targeted effort (trap net-lifts or 1,000 feet of large-mesh gill net) by management unit in 1836 Treaty-ceded waters of the Great Lakes for the 2012 fishing season. Minor harvest from small-mesh gill nets is also included in gill-net harvest, but not effort.

		Trap nets		Gill nets		Total
Lake	Unit	Harvest	Effort	Harvest	Effort	harvest
Michigan	WFM-01	952,326	1,946	0	0	952,326
	WFM-02	137,259	176	189,600	3,673	326,859
	WFM-03	453,533	2,209	446,603	5,773	900,136
	WFM-04	106,325	757	179,923	3,026	286,248
	WFM-05	1,650	4	28,500	1,004	30,150
	WFM-06	98,861	297	587	7	99,448
	WFM-07	48,449	124	0	0	48,449
	WFM-08	20,809	68	0	0	20,809
Lake totals		1,819,212	5,581	845,213	13,483	2,664,425
Huron	Northern	280,239	1,331	363,606	7,236	643,845
	WFH-05	339,302	365	0	0	339,302
Lake totals		619,541	1,696	363,606	7,236	983,147
Superior	WFS-04	0	0	0	0	0
	WFS-05	0	0	71,761	1,329	71,761
	WFS-06	0	0	7,977	497	7,977
	WFS-07	216,884	1,374	215,989	2,604	432,873
	WFS-08	97,003	565	10,015	75	107,018
Lake totals		313,887	1,939	305,742	4,505	619,629
Grand totals		2,752,640	9,216	1,514,561	25,224	4,267,201

3. Walleye

Commercial fishing for walleye is permitted in and around Grand Traverse Bay and the Manitou Islands, in northeastern Lake Michigan (Naubinway to Gros Cap), and around St. Martin’s Bay and the Les Cheneaux Islands in Lake Huron. There are gear, season, depth, size, and area restrictions on the various walleye fisheries, though no harvest limits are set forth in the Consent Decree. Walleye are occasionally harvested as incidental catch; thus, sometimes there is harvest with no effort listed for a unit because the fishers were actually targeting other species. The largest reported walleye harvest in 2012 occurred in Lake Huron unit MH-1 (20,500 pounds).

Table 8. Summary of tribal commercial walleye harvest (pounds) and targeted effort (trap-net lifts or 1,000 feet of small or large mesh gill net) by management unit in 1836 Treaty-ceded waters of the Great Lakes for the 2012 fishing season.

		Trap nets		Gill nets		Total harvest
Lake	Unit	Harvest	Effort	Harvest	Effort	
Michigan	MM-123	439	0	5,937	35	6,376
	MM-4	130	0	400	1	530
	MM-5	161	0	216	0	377
Lake totals		730	0	6,553	36	7,283
Huron	MH-1	0	0	20,500	552	20,500
Superior	MI-8	519	0	599	6	1,118
Grand totals		1,249	0	27,652	594	28,901

4. Yellow perch

Commercial fisheries for yellow perch exist in northeastern Lake Michigan around Grand Traverse Bay and the Manitou Islands, around the Beaver Islands, and near the northeastern shore. A yellow perch fishery also exists in Lake Huron around the Les Cheneaux Islands. The fishery has gear, depth, area, season, and size restrictions; though no harvest limits are set forth in the Consent Decree. The largest yellow perch harvest in 2012 was in MM-123 where 908 pounds were harvested (Table 9). Yellow perch are occasionally harvested as incidental catch, which is why often there is harvest with no effort listed for a unit because the fishers were actually targeting other species.

Table 9. Summary of tribal commercial yellow perch harvest (pounds) and targeted effort (trap-net lifts or 1,000 feet of large-mesh and small-mesh gill net) by management unit in 1836 Treaty-ceded waters of the Great Lakes for the 2012 fishing season.

		Trap nets		Gill nets		Total
Lake		Harvest	Effort	Harvest	Effort	Harvest
Michigan	MM-123	5	0	903	13	908
	MM-4	5	0	549	24	554
	MM-5	139	0	50	3	189
Lake totals		149	0	1,502	40	1,651
Huron	MH-1	0	0	66	0	66
Superior	MI-8	0	0	12	0	12
Grand totals		149	0	1,580	40	1,729

5. Chinook and Coho salmon

Tribal commercial fisheries for salmon exist in northeastern Lake Michigan near shore from McGulpin Point south to Seven Mile Point, around the tip of the Leelanau Peninsula, and in Suttons Bay. Fisheries in northern Lake Huron exist in St Martin Bay, and near shore from Cordwood Point to Hammond Bay Harbor light. There is no target fishery for salmon in Lake Superior, but gill-net fishers are allowed to harvest these species as incidental catch. Fishing is restricted by season, gear, depth, and area; though no harvest limits are set. As in most years, the largest Chinook salmon harvest in 2012 occurred in Lake Huron unit MH-1 (Table 10). The 158,686 lb harvested in MH-1 represents a 47% reduction from the 2011 take of Chinook salmon; however, it is close to the level of 2010 harvest. Coho salmon were exclusively harvested from Lake Superior (Table 11).

Table 10. Summary of Tribal commercial Chinook salmon harvest (pounds) and targeted effort (trap-net or 1,000 feet of gill net) by management unit in 1836 Treaty-ceded waters of the Great Lakes for the 2012 fishing season.

		Trap nets		Gill nets		Total harvest
Lake	Unit	Harvest	Effort	Harvest	Effort	
Michigan	MM-123	252	0	1,219	0	1,471
	MM-4	0	0	456	6	456
Lake totals		252	0	1,675	6	1,927
Huron	MH-1	0	0	158,686	1,702	158,686
Superior		0	0	0	0	0
Grand totals		252	0	160,361	1,708	160,613

Table 11. Summary of Tribal commercial Coho salmon harvest (pounds) and targeted effort (trap-net lifts or 1,000 feet of gill net) by management unit in 1836 Treaty-ceded waters of the Great Lakes for the 2012 fishing season.

		Trap nets		Gill nets		Total harvest
Lake	Unit	Harvest	Effort	Harvest	Effort	
Superior	MI-6	0	0	145	0	145
	MI-7	0	0	561	0	561
	MI-8	1,076	0	3,520	0	4,596
Grand Totals		1,076	0	4,226	0	5,302

6. Subsistence fishing

Subsistence fishing as defined in the Consent Decree means taking fish for personal or family consumption and not for sale or trade. Tribal subsistence fishing is allowed in all 1836 Treaty-ceded waters with some exceptions. These exceptions include: no gill nets in lake trout refuges; no nets within 100 yards of a break wall or pier; no nets within a 0.3-mile radius of certain stream mouths (listed in section IV.C.8 of the Consent Decree); no prevention of fish passage into and out of streams that flow into 1836 Treaty waters; no gill nets or walleye possession in portions of the Bays De Noc during March 1 - May 15; no gill nets within 50 feet of other gill nets. Fishers are limited to 100 pounds aggregate catch of all species in possession, and catch may not be sold or traded. Subsistence fishers may use impoundment gear, hooks, spears, seines, dip nets, and gill nets. Gill netting is limited to one 300-ft or smaller net per vessel per day. In the St. Marys River a single gill net may not exceed 100 ft in length. All subsistence gear must be marked clearly with floats, and Tribal identification numbers. Tribal fishers must obtain subsistence licenses issued from their respective Tribe, and must abide by provisions of the Tribal Code. Additionally, subsistence fishing with gill or trap net requires a Tribal permit that may be limited in duration and by area. The MDNR is to be provided with copies of all subsistence licenses and permits. The Consent Decree states that data from the subsistence harvest reports of Tribal fishers shall be compiled by CORA and provided to the Parties within six (6) months. Final 2012 data, as reported by the tribes, is included below in Tables 12 and 13.

Table 12. Summary of final tribal subsistence harvest (round pounds) with gill nets for each management unit by species for the 2012 fishing season.

Gear	Unit	Bass	Brook Trout	Brown Trout	Bullhead	Burbot	Carp	Catfish	Cisco	Lake trout	Menominee
Gill Net	MH-1	0	1	14	0	0	0	2	0	355	105
	MH-2	4	0	0	0	0	0	0	0	0	0
	MI-6	0	0	7	0	26	0	0	47	293	22
	MI-7	0	0	0	0	0	0	0	0	0	12
	MI-8	0	4	0	0	0	0	0	914	153	15
	MM-123	136	0	15	26	124	30	27	0	374	2
	MM-67	3	0	25	0	0	0	0	0	301	0
	St. Marys River	53	0	0	11	0	318	2	317	0	0
	Totals	196	5	61	37	150	348	30	1,278	1,477	156

Gear	Unit	Perch	Northern Pike	Salmon	Smelt	Splake	Steelhead	Sucker	Walleye	Whitefish	Total Gill-Net Effort
Gill Net	MH-1	3	23	148	56	0	116	68	387	346	14,502
	MH-2	0	73	0	0	0	18	0	0	0	300
	MI-6	0	0	436	0	146	226	348	2	964	19,070
	MI-7	0	0	508	0	0	143	176	2	29	3,000
	MI-8	0	145	937	1,238	26	251	455	501	826	32,511
	MM-123	1,381	377	118	0	0	842	240	3,142	1,327	69,165
	MM-67	0	11	107	0	0	408	0	0	0	3,925
	St. Marys River	54	216	212	0	30	13	10	335	336	7,750
	Totals	1,439	844	2,465	1,294	201	2,017	1,297	4,369	3,829	150,223

Table 13. Summary of final tribal subsistence harvest (round pounds) via snagging, traditional hook and line, tip-ups, dip nets, and spears (combined) for each management unit by species for the 2012 fishing season.

Gear	Unit	Atlantic salmon	Bass	Freshwater Drum	Herring	Perch	Pike	Salmon	Steelhead	Walleye	Whitefish
Hook and Line, snagging, Tip-up, Dip Net, and Spear	MH-1	0	0	0	0	78	3	30	0	0	0
	MI-7	0	0	0	0	0	0	6	6	0	0
	MI-8	14	0	0	0	18	0	69	22	42	14
	MM-123	0	0	0	0	60	0	0	0	268	0
	St. Marys River	262	4	9	3	151	155	945	118	140	104
	Totals	276	4	9	3	307	158	1,049	146	450	118

7. Fisheries Contacts

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LAW ENFORCEMENT

I. Introduction

The 2000 Consent Decree established a Law Enforcement Committee (LEC) as the primary body for consultation and collaboration on enforcement issues pertaining to the fishery in 1836 Treaty-Ceded Waters of the Great Lakes. The LEC is composed of the chief law enforcement officer or designee of each tribe and the chief law enforcement officer or designee of the Michigan Department of Natural Resources (MDNR). The LEC is required to meet four times a year with the first meeting taking place in January. The Decree requires that the LEC review summary reports of all law enforcement activities of member agencies during the previous year. This report provides a summary of 1836 Treaty fishery enforcement activity for the MDNR Commercial Fish Enforcement Unit (CFEU) in 2012.

A. General Information

1. Staffing

At the present time, the Commercial Fish Enforcement Unit (CFEU) is manned by (3) Commercial Fish Boat Captains, (1) Commercial Fish Investigator, and (1) Unit Supervisor. In 2012, the MDNR Law Enforcement Division worked 4,697 hours in Consent Decree Enforcement.

Table 14. 2010 officer hours worked for Consent Decree and state commercial fish issues.

Enforcement Effort	CFEU (hrs)
Consent Decree	4,697
State Commercial	2,589
Wholesale Fish	399
Totals	7,685

2. Equipment

For the 2012 season all of the SeaArk Dauntless Class vessels were put to use for a total of 533 sea service hours. In addition, there were approximately 161 hours utilized on district assigned vessels and/or other agencies vessels, 10 hours put on the CFEU's small Schafer boat that can be trailered for a total of 704 service hours logged on the water. During the 2012 season, the CFEU conducted a total of 150 dedicated patrols for commercial fish enforcement.

The CFEU boats consumed 5,082 gallons of fuel with a fuel expenditure of $20,975.24. The CFEU patrol boat assigned to Lake Michigan (Rick Asher) was fitted with a new gill net lifter in 2012.

Table 15. 2012 CFEU vessel service hours.

Vessel	1836 Treaty Fishery	State Fishery	1842 Treaty Fishery	Total
William Alden Smith	36.5	20.5	0	57
Ransom Hill	85	14	0	99
Shaffer	0	10	0	10
M.W. Neal	0	234	0	234
Rick Asher	133	10	0	143
Other Vessels	147	14	0	161
Totals	401.5	302.5	0	704

Table 16. 2012 CFEU patrols, fuel consumption & fuel costs.

Vessel	Patrols	Fuel (Gal)	Cost ($)
William Alden Smith	16	770.72	$3,288.48
Ransom Hill	22	1,566.05	$6,413.83
Shaffer	3	30	104.70
M.W. Neal	52	558.71	$2,021.75
Rick Asher	30	2,156.84	$9,146.48
Other Vessels	27	N/A	N/A
Totals	150	5,082.32	$20,975.24

B. Enforcement

1. Complaints and Violations

In 2012, the CFEU investigated a total of 66 complaints, with 24 related to 1836 and Tribal commercial fishing; 26 complaints were received on the state commercial fishery, and 12 complaints were received related to the wholesale fish business. Some of these complaints were unfounded, and the others resulted in a total of 54 citations being issued. A total of 50 verbal warnings were issued, and 2 referrals were made to tribal officers.

Table 17. 2012 commercial fish complaints investigated by the CFEU.

Complaints	1836 Treaty Fishery	State Fishery	1842 Treaty Fishery	Totals
Nets	14	4	2	20
Licensing	1	0	1	2
Access	3	0	0	3
Wholesale	0	12	0	12
Bait	1	1	0	2
Other	5	22	0	27
Totals	24	39	3	66

Table 18. 2012 summary of commercial fisheries related violations

Violations	1836 Treaty Fishery	State Fishery	1842 Treaty Fishery	Totals
Arrests	40	14	0	54
Referrals	2	0	0	2
Warnings	21	29	0	50
Totals	63	43	0	106

2. Inspections

Unit members completed a total of 932 inspections in 2012. These included 425 net inspections, 81 on water boardings, 287 dockside inspections, and 117 state wholesale inspections.

Table 19. 2012 CFEU inspections (from vessel log books & inspection forms).

Inspections	1836 Treaty Fishery	State Fishery	1842 Treaty Fishery	Totals
Nets	182	242	1	425
Boardings	67	13	1	81
Docksides	161	125	1	287
State Wholesale	0	117	0	117
Bait	0	77	0	77
Totals	410	574	3	987

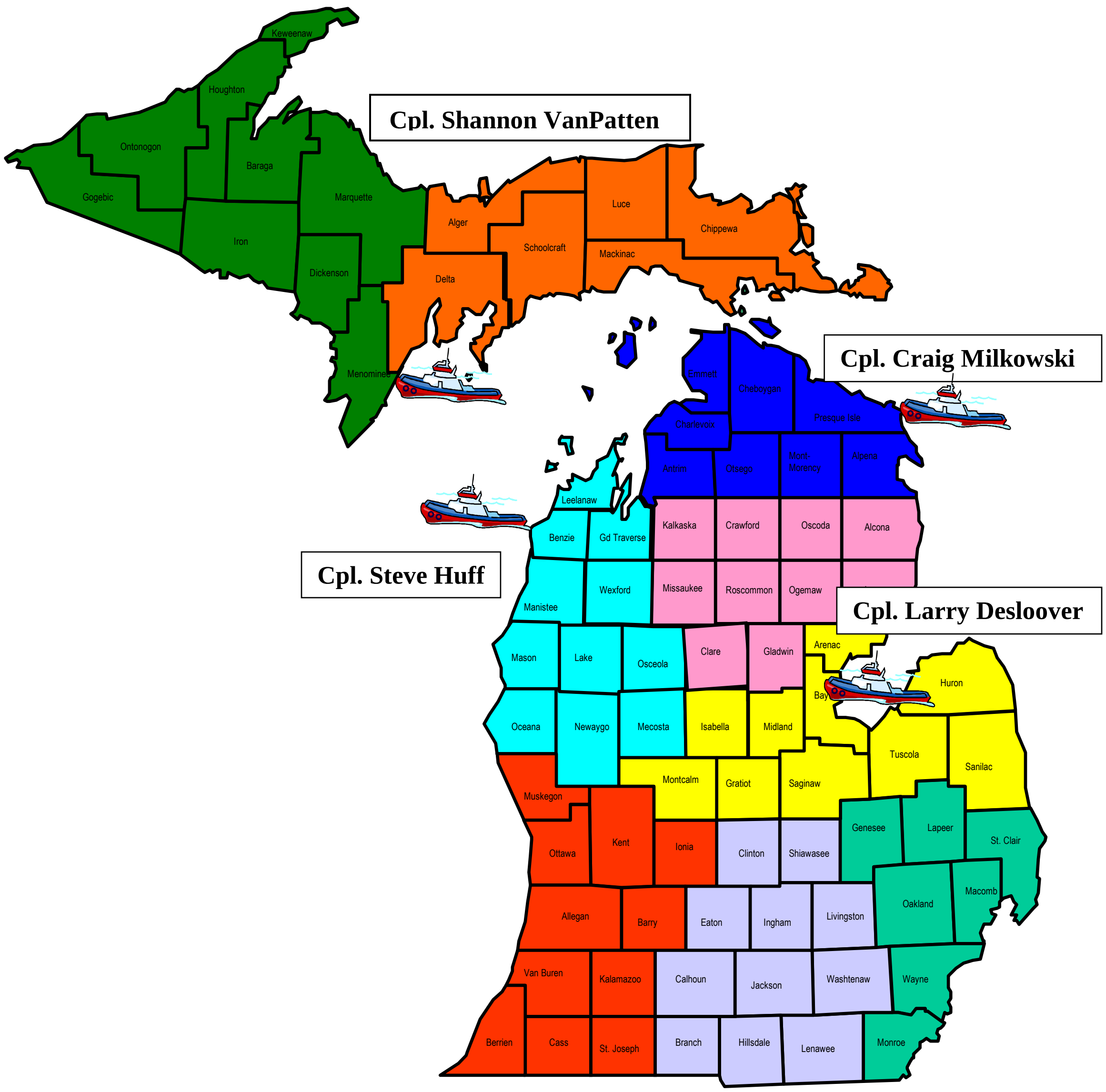
C. Patrols

1. Law Enforcement Committee Sponsored Group Patrols

Table 20. LEC Group Patrol Schedule 2012.

DATE	LOCATION	TYPE OF PATROL	LEAD OFFICER
March 2-3	Bay de Noc Ice Patrol	Group Patrol	Officer Roger Willis Little Traverse Band
March 10-11	Munoscong Bay, Hessel, Detour, Les Cheneaux, St. Mary's River (Tournament)	Group Patrol	Officer Sam Gardner Sault Tribe
April 13-15	Bay de Noc Subsistence	Group Patrol	Officer Roger Willis Little Traverse Band
May 9-10	Whitehall to Manistee/ Ludington and East and West Bay	Group Patrol	Sgt. Robert Robles Little River Band
May 21-22	Lake Huron	Group Patrol	MDNR
June 25-26 LEC Meeting	Beaver Island	Group Patrol Over Night Stay	Cpl. Steve Huff MDNR
July 10-11	Whitefish Bay, St. Mary's River	Group Patrol	Bay Mills
August 21-22	Northern Lake Huron & Lake Michigan – Salmon Fishery	Group Patrol	Officer Roger Willis Little Traverse Band
September	Whitefish Bay, St. Mary's River	Group Patrol	Bay Mills
October 10-11	Bay de Noc	Group Patrol	Cpl. Terry Short MDNR
October 24-25	Northern Lake Huron	Group Patrol	Bay Mills
November 5-6 Whitefish Closure	Home Ports	Individual/Group Patrols	

Michigan Department of Natural Resources
Commercial Fish Enforcement Section



3. Law Enforcement Contacts

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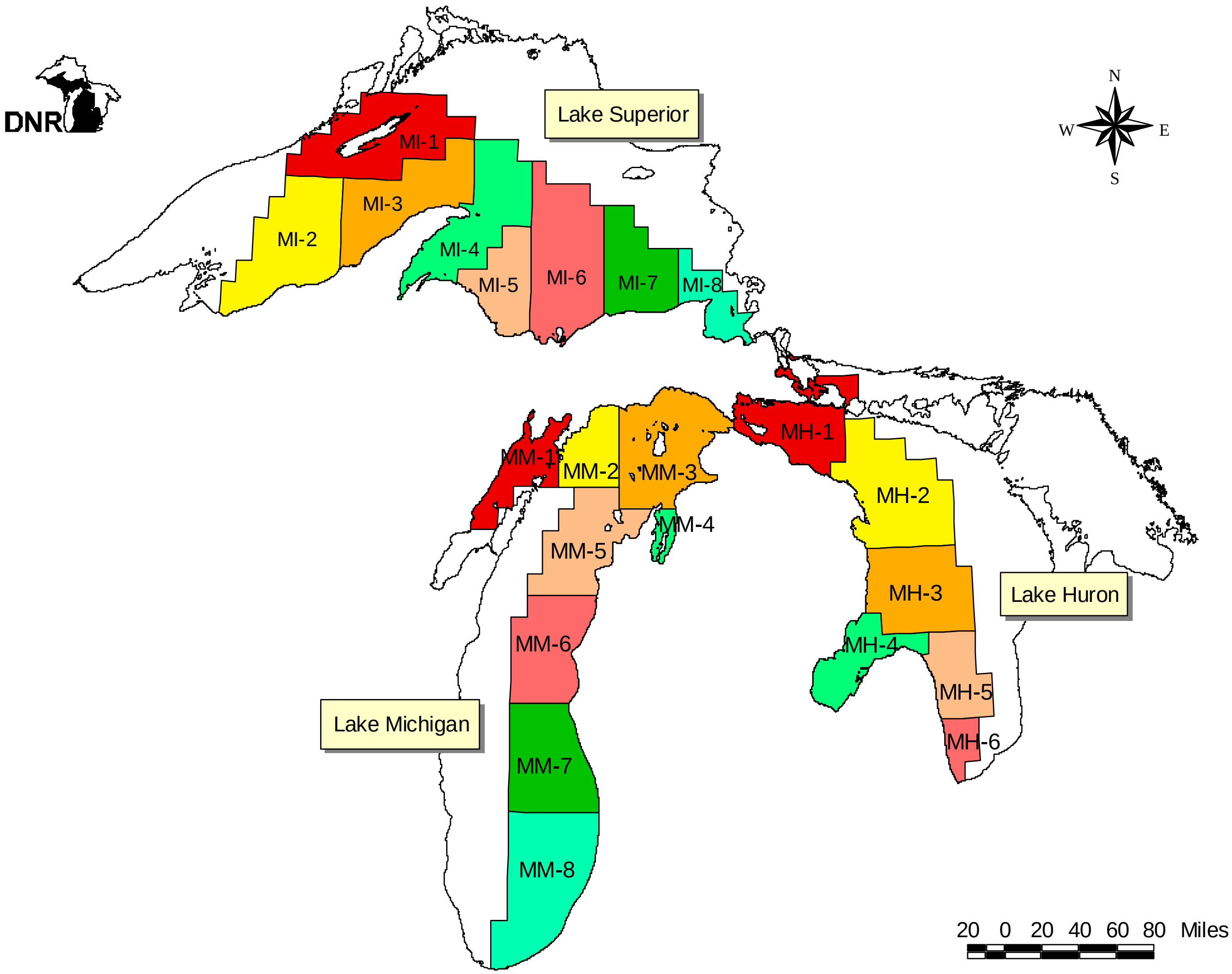

Figure 1. Lake Trout Management Units for Lakes Superior, Michigan and Huron.

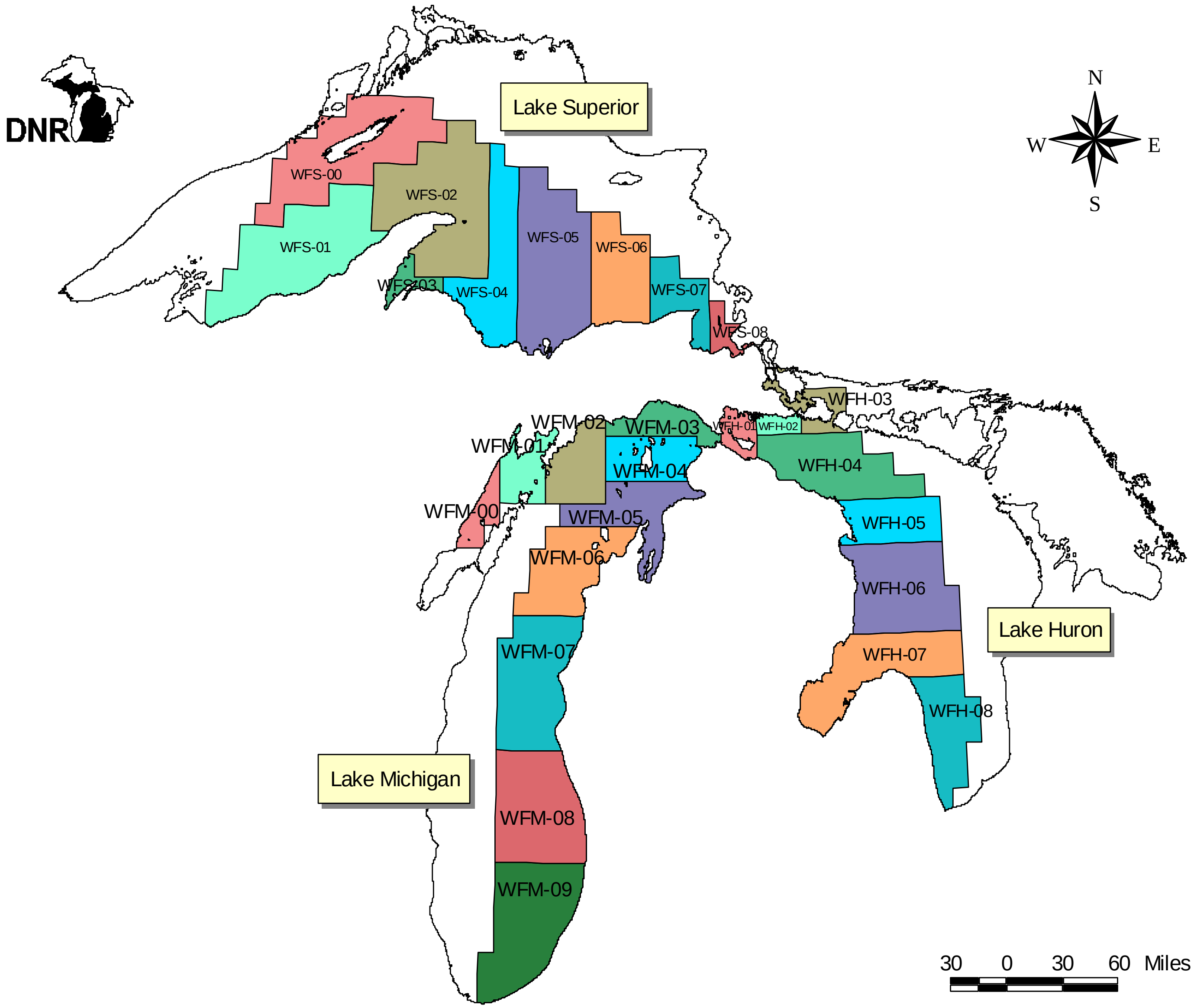

Figure 2. Lake Whitefish Management Units for Lakes Superior, Michigan and Huron.

Appendices

Appendix 1. Model estimates of harvest quota for lake trout by lake trout Management Unit in the 1836 Treaty-ceded waters of the Great Lakes as used during the final stages of negotiations.

Appendix 2. Model estimates of harvest quota for lake whitefish by whitefish Management Unit in the 1836 Treaty-ceded waters of the Great Lakes as used during the final stages of negotiations.

Apppendix 1.   Lake Trout, Lake Huron, MH-1

Scenario =Effort-based, phase-in on commercial fishery from 2001 through 2005. Phase in a 24-in minimum size limit on sport fishery by 2005.
Extended phase-in of allocation percentages at 47% TAM from 2006 through 2011. Rehabiltation period at 45% TAM from 2012 through 2020.
Starting in 2002, stock 0.6 per acre of federal yearlings plus 100,000 MDNR yearlings. No change in Canadian commercial effort.

47% SSBR = 0.11
45% SSBR = 0.13

	Commercial (Tribal)				Recreational (State)							Lake trout population	
Year	Effort limit (million feet)	Harvest limit (pounds)	CPUE (pounds per million feet)	Percent of allowable harvest	Potential effort (hours)	Minimum size limit	Harvest limit (pounds)	CPUE (fish per 100 hours)	CPUE (pounds per 100 hours)	Average size (pounds)	Percent of allowable harvest	Female spawning biomass	SSBR
Reference Period													
1996	17.155	242,057	14,110	94%	116,026	10	15,869	4.0	13.7	3.4	6%		
1997	13.107	163,885	12,504	93%	124,637	10	12,665	2.8	10.2	3.6	7%		
1998	13.139	130,863	9,960	92%	129,874	10	11,939	2.3	9.2	4.0	8%	8,782	
Phase-in Period (Effort-Based for Commercial Fishery, Size Limit-Based for Recreational Fishery)													
2001	12.297	155,548	12,649	94%	123,512	20	9,400	2.0	7.6	3.8	6%	10,929	0.03
2002	7.957	112,004	14,077	91%	123,512	20	10,793	2.2	8.7	3.9	9%	15,974	0.04
2003	6.655	104,682	15,730	92%	123,512	22	9,141	1.8	7.4	4.1	8%	22,439	0.06
2004	5.787	107,177	18,521	91%	123,512	22	11,029	2.1	8.9	4.2	9%	30,473	0.09
2005	5.787	137,309	23,728	93%	123,512	24	9,919	1.9	8.0	4.2	7%	40,315	0.10
Extended Phase-in Period (TAM = 47%, Phase in of Allocation Percentages)													
2006	5.497	160,708	29,233	92%	135,864	24	13,934	2.4	10.3	4.3	8%	52,623	0.11
2007	5.931	196,919	33,199	92%	142,039	24	17,734	2.8	12.5	4.5	8%	67,344	0.11
2008	6.221	220,556	35,455	91%	148,215	24	21,113	3.1	14.2	4.6	9%	82,793	0.11
2009	6.365	233,171	36,631	91%	154,390	24	23,952	3.3	15.5	4.7	9%	96,081	0.11
2010	6.365	237,507	37,312	90%	154,390	24	25,410	3.4	16.5	4.8	10%	106,565	0.11
2011	6.510	245,712	37,743	90%	154,390	24	26,540	3.5	17.2	4.8	10%	114,382	0.11
Rehabilitation Period (TAM = 45%, Final Allocation - Tribal Share=88%, State Share=12%)													
2012	5.642	217,239	38,503	88%	158,096	24	28,378	3.7	18.0	4.9	12%	122,637	0.13
2013	5.642	223,029	39,530	88%	158,096	24	29,784	3.8	18.8	4.9	12%	130,495	0.13
2014	5.642	226,658	40,173	88%	158,096	24	30,920	3.9	19.6	5.0	12%	137,403	0.13
2015	5.787	234,045	40,445	88%	154,390	24	30,984	4.0	20.1	5.0	12%	142,788	0.13
2016	5.787	234,278	40,485	88%	154,390	24	31,483	4.0	20.4	5.0	12%	146,676	0.13
2017	5.787	234,257	40,482	88%	154,390	24	31,827	4.1	20.6	5.1	12%	149,351	0.13
2018	5.787	234,192	40,470	88%	154,390	24	32,069	4.1	20.8	5.1	12%	151,166	0.13
2019	5.787	234,147	40,463	88%	154,390	24	32,241	4.1	20.9	5.1	12%	152,418	0.13
2020	5.787	234,126	40,459	88%	154,390	24	32,364	4.1	21.0	5.1	12%	153,296	0.13

Appendix 1. Lake Trout, Lake Huron, MH-2

Scenario = Phase in a 24-in minimum size limit on sport fishery by 2005. Assume minimal subsistence fishing.
Assume sport fishing effort gradually increases by 25%. No change in Canadian commercial effort.

40% SSBR = 0.32

	Commercial (Tribal)				Recreational (State)							Lake trout population	
Year	Effort limit (million feet)	Harvest limit (pounds)	CPUE (pounds per million feet)	Percent of allowable harvest	Potential effort (hours)	Minimum size limit	Harvest limit (pounds)	CPUE (fish per 100 hours)	CPUE (pounds per 100 hours)	Average size (pounds)	Percent of allowable harvest	Female spawning biomass	SSBR
Reference Period													
1996	0.000	-	-	0%	213,906	10	45,841	5.1	21.4	4.2	100%		
1997	0.000	-	-	0%	212,802	10	53,203	6.1	25.0	4.1	100%		
1998	0.000	-	-	0%	157,710	10	41,558	5.9	26.4	4.5	100%	106,461	
Phase-in Period (Size Limit-Based for Recreational Fishery)													
2001	Subsistence	442	na	1%	194,806	20	47,517	5.7	24.4	4.3	99%	160,291	0.40
2002	Subsistence	333	na	1%	194,806	20	51,329	6.1	26.3	4.3	99%	193,286	0.35
2003	Subsistence	473	na	1%	214,287	22	44,672	4.3	20.8	4.9	99%	221,535	0.42
2004	Subsistence	608	na	1%	214,287	22	41,897	3.9	19.6	5.0	99%	248,990	0.51
2005	Subsistence	686	na	2%	233,767	24	33,975	2.9	14.5	5.1	98%	267,891	0.58
Rehabilitation Period (TAM = 40%)													
2006	Subsistence	816	na	2%	233,767	24	34,419	3.0	14.7	4.9	98%	282,713	0.64
2007	Subsistence	943	na	2%	243,508	24	38,251	3.2	15.7	4.9	98%	301,388	0.69
2008	Subsistence	991	na	2%	243,508	24	41,065	3.4	16.9	5.0	98%	325,931	0.73
2009	Subsistence	1,033	na	2%	243,508	24	43,311	3.5	17.8	5.0	98%	353,119	0.75
2010	Subsistence	1,076	na	2%	243,508	24	44,837	3.6	18.4	5.1	98%	380,032	0.78
2011	Subsistence	1,091	na	2%	243,508	24	45,872	3.7	18.8	5.1	98%	404,769	0.80
2012	Subsistence	1,102	na	2%	243,508	24	46,592	3.7	19.1	5.1	98%	426,678	1
2013	Subsistence	1,110	na	2%	243,508	24	47,098	3.8	19.3	5.2	98%	445,792	1
2014	Subsistence	1,115	na	2%	243,508	24	47,432	3.8	19.5	5.2	98%	461,963	0.82
2015	Subsistence	1,118	na	2%	243,508	24	47,635	3.8	19.6	5.2	98%	475,258	0.82
2016	Subsistence	1,119	na	2%	243,508	24	47,746	3.8	19.6	5.2	98%	485,903	0.82
2017	Subsistence	1,120	na	2%	243,508	24	47,803	3.8	19.6	5.2	98%	494,300	0.82
2018	Subsistence	1,120	na	2%	243,508	24	47,830	3.8	19.6	5.2	98%	500,853	0.82
2019	Subsistence	1,121	na	2%	243,508	24	47,842	3.8	19.6	5.2	98%	505,928	0.82
2020	Subsistence	1,121	na	2%	243,508	24	47,847	3.8	19.6	5.2	98%	509,839	0.82

Appendix 1. Lake Trout, Lake Michigan, MM-1/2/3

Scenario =Assume commercial effort and sport effort increases by 25%.
Maintain 24-inch size limit on sport fishery.

40% SSBR = 0.77
2006 SSBR = 0.98
2020 SSBR = 1.02

	Commercial (Tribal)				Recreational (State)							Lake trout population	
Year	Effort limit (million feet)	Harvest limit (pounds)	CPUE (pounds per million feet)	Percent of allowable harvest	Potential effort (hours)	Minimum size limit	Harvest limit (pounds)	CPUE (fish per 100 hours)	CPUE (pounds per 100 hours)	Average size (pounds)	Percent of allowable harvest	Female spawning biomass	SSBR
Reference Period													
1996	17.536	749,556	42,744	90%	103,045	24	80,837	13.1	78.4	6.0	10%		
1997	15.311	685,279	44,757	89%	124,056	24	87,450	11.0	70.5	6.4	11%		
1998	14.472	781,010	53,967	88%	135,878	24	110,251	12.1	81.1	6.7	12%		
Rehabilitation Period (TAM = 40%)													
2001	19.716	548,805	27,835	89%	151,241	24	67,589	6.4	44.7	7.0	11%		
2002	19.716	498,310	25,274	89%	151,241	24	60,877	5.9	40.3	6.8	11%		
2003	19.716	464,066	23,537	89%	151,241	24	56,730	5.6	37.5	6.7	11%		
2004	19.716	442,790	22,458	89%	151,241	24	54,102	5.4	35.8	6.6	11%		
2005	19.716	431,674	21,894	89%	151,241	24	52,243	5.3	34.5	6.5	11%		
2006	19.716	427,203	21,668	89%	151,241	24	51,318	5.3	33.9	6.4	11%		
2007	19.716	426,332	21,623	89%	151,241	24	51,056	5.3	33.8	6.4	11%		
2008	19.716	426,837	21,649	89%	151,241	24	51,030	5.3	33.7	6.4	11%		
2009	19.716	427,734	21,695	89%	151,241	24	51,101	5.3	33.8	6.4	11%		
2010	19.716	428,616	21,739	89%	151,241	24	51,244	5.3	33.9	6.4	11%		
2011	19.716	429,374	21,778	89%	151,241	24	51,374	5.3	34.0	6.4	11%		
2012	19.716	430,011	21,810	89%	151,241	24	51,460	5.3	34.0	6.4	11%		
2013	19.716	430,504	21,835	89%	151,241	24	51,530	5.3	34.1	6.4	11%		
2014	19.716	430,827	21,851	89%	151,241	24	51,582	5.3	34.1	6.4	11%		
2015	19.716	431,013	21,861	89%	151,241	24	51,613	5.3	34.1	6.4	11%		
2016	19.716	431,111	21,866	89%	151,241	24	51,630	5.3	34.1	6.4	11%		
2017	19.716	431,159	21,868	89%	151,241	24	51,639	5.3	34.1	6.4	11%		
2018	19.716	431,181	21,869	89%	151,241	24	51,644	5.3	34.1	6.4	11%		
2019	19.716	431,191	21,870	89%	151,241	24	51,646	5.3	34.1	6.4	11%		
2020	19.716	431,195	21,870	89%	151,241	24	51,647	5.3	34.1	6.4	11%		

Appendix 1. Lake Trout, Lake Michigan, MM-4

Scenario =Effort-based, phase-in on commercial fishery from 2001 through 2005. Phase in a 24-in minimum size limit on sport fishery by 2005. Forty-five percent TAM and 60/40 split from 2006 through 2009. Forty-five percent TAM and 55/45 split from 2010 through 2020.

45% SSBR = 0.40

	Commercial (Tribal)				Recreational (State)							Lake trout population	
Year	Effort limit (million feet)	Harvest limit (pounds)	CPUE (pounds per million feet)	Percent of allowable harvest	Potential effort (hours)	Minimum size limit	Harvest limit (pounds)	CPUE (fish per 100 hours)	CPUE (pounds per 100 hours)	Average size (pounds)	Percent of allowable harvest	Female spawning biomass	SSBR
Reference Period													
1996	2.260	112,637	49,840	78%	191,401	24	31,935	2.5	16.7	6.7	22%		
1997	1.776	109,354	61,573	59%	278,426	24	76,613	4.3	27.5	6.4	41%		
1998	1.556	160,063	102,868	52%	303,290	20	147,006	8.9	48.5	5.4	48%	149,532	
Effort-Based, Phase-in Period													
2001	1.864	129,753	69,610	64%	257,706	20	74,398	5.0	28.9	5.8	36%	124,666	
2002	1.268	93,833	74,029	54%	257,706	20	78,623	5.2	30.5	5.8	46%	135,249	
2003	1.268	100,951	79,645	59%	257,706	22	70,682	4.4	27.4	6.2	41%	149,413	
2004	1.268	105,272	83,054	58%	257,706	22	75,041	4.6	29.1	6.3	42%	159,232	
2005	1.268	108,645	85,714	64%	257,706	24	62,260	3.7	24.2	6.6	36%	167,267	
Rehabilitation Period (TAM = 45%, Tribal Share 60%, State Share 40%)													
2006	1.230	108,487	88,183	60%	288,630	24	72,421	3.8	25.1	6.6	40%	172,800	0.40
2007	1.230	110,259	89,624	60%	288,630	24	74,098	3.8	25.7	6.7	40%	176,541	0.40
2008	1.230	111,435	90,580	60%	288,630	24	75,202	3.9	26.1	6.7	40%	178,995	0.40
2009	1.230	112,146	91,158	60%	288,630	24	75,879	3.9	26.3	6.7	40%	180,579	0.40
Rehabilitation Period (TAM = 45%, Tribal Share 55%, State Share 45%)													
2010	1.156	105,649	91,417	55%	322,132	24	84,988	3.9	26.4	6.7	45%	180,988	0
2011	1.156	105,777	91,528	55%	322,132	24	85,063	3.9	26.4	6.8	45%	181,357	0
2012	1.156	105,888	91,624	55%	322,132	24	85,152	3.9	26.4	6.8	45%	181,706	0.40
2013	1.156	105,979	91,703	55%	322,132	24	85,237	3.9	26.5	6.8	45%	181,979	0.40
2014	1.156	106,046	91,760	55%	322,132	24	85,299	3.9	26.5	6.8	45%	182,169	0.40
2015	1.156	106,087	91,796	55%	322,132	24	85,339	3.9	26.5	6.8	45%	182,294	0.40
2016	1.156	106,111	91,817	55%	322,132	24	85,363	3.9	26.5	6.8	45%	182,370	0.40
2017	1.156	106,125	91,829	55%	322,132	24	85,377	3.9	26.5	6.8	45%	182,417	0.40
2018	1.156	106,133	91,836	55%	322,132	24	85,384	3.9	26.5	6.8	45%	182,444	0.40
2019	1.156	106,137	91,839	55%	322,132	24	85,387	3.9	26.5	6.8	45%	182,462	0.40
2020	1.156	106,139	91,841	55%	322,132	24	85,388	3.9	26.5	6.8	45%	182,473	0.40

Appendix 1. Lake Trout, Lake Michigan, MM-5

Scenario =Assume sport effort increases by 25% and commercial effort is controlled by harvest limit.
Phase in a 24-in minimum size limit on sport fishery by 2005.

45% SSBR = 0.29

	Commercial (Tribal)				Recreational (State)							Lake trout population	
Year	Effort limit (million feet)	Harvest limit (pounds)	CPUE (pounds per million feet)	Percent of allowable harvest	Potential effort (hours)	Minimum size limit	Harvest limit (pounds)	CPUE (fish per 100 hours)	CPUE (pounds per 100 hours)	Average size (pounds)	Percent of allowable harvest	Female spawning biomass	SSBR
Reference Period													
1996	0.215	40,965	190,533	32%	323,133	10	86,964	4.8	26.9	5.6	68%		
1997	0.332	75,478	227,344	53%	332,193	10	68,233	3.7	20.5	5.6	47%		
1998	0.487	47,996	98,555	35%	363,157	10	88,251	4.0	24.3	6.1	65%	131,889	
Rehabilitation Period (TAM = 45%)													
2001	0.312	45,876	147,075	42%	339,494	22	62,179	2.7	18.3	6.8	58%	134,820	
2002	0.312	46,579	149,329	43%	339,494	22	62,814	2.7	18.5	6.8	57%	136,008	
2003	0.314	47,028	149,939	42%	339,494	22	63,776	2.8	18.8	6.8	58%	138,536	
2004	0.324	48,156	148,635	43%	339,494	22	64,003	2.7	18.9	6.9	57%	139,226	
2005	0.362	53,498	147,825	46%	339,494	24	63,763	2.7	18.8	6.9	54%	139,419	
2006	0.334	49,753	148,817	49%	339,494	24	52,693	2.2	15.5	7.2	51%	141,429	0.33
2007	0.327	48,998	149,644	46%	373,444	24	58,473	2.2	15.7	7.2	54%	142,217	0.32
2008	0.321	47,909	149,463	43%	407,393	24	63,678	2.2	15.6	7.2	57%	141,596	0.32
2009	0.324	48,146	148,604	42%	424,368	24	65,757	2.2	15.5	7.2	58%	140,282	0.31
2010	0.326	48,145	147,815	42%	424,368	24	65,281	2.1	15.4	7.2	58%	139,378	0.31
2011	0.327	48,250	147,358	43%	424,368	24	64,969	2.1	15.3	7.2	57%	138,840	0.31
2012	0.327	48,176	147,133	43%	424,368	24	64,790	2.1	15.3	7.1	57%	138,578	0.31
2013	0.331	48,636	146,991	43%	424,368	24	64,678	2.1	15.2	7.1	57%	138,358	0.31
2014	0.331	48,594	146,864	43%	424,368	24	64,594	2.1	15.2	7.1	57%	138,195	0.31
2015	0.331	48,570	146,792	43%	424,368	24	64,538	2.1	15.2	7.1	57%	138,088	0.31
2016	0.331	48,557	146,752	43%	424,368	24	64,504	2.1	15.2	7.1	57%	138,021	0.31
2017	0.331	48,550	146,731	43%	424,368	24	64,485	2.1	15.2	7.1	57%	137,980	0.31
2018	0.331	48,547	146,719	43%	424,368	24	64,474	2.1	15.2	7.1	57%	137,956	0.31
2019	0.331	48,545	146,714	43%	424,368	24	64,468	2.1	15.2	7.1	57%	137,941	0.31
2020	0.331	48,544	146,711	43%	424,368	24	64,465	2.1	15.2	7.1	57%	137,932	0.31

Appendix 1. Lake Trout, Lake Michigan, MM-6/7

Scenario =Assume minimal subsistence fishing. Assume sport effort increases by 25%.

40% SSBR = 0.63
2006 SSBR = 1.13
2020 SSBR = 1.13

	Commercial (Tribal)				Recreational (State)							Lake trout population	
Year	Effort limit (million feet)	Harvest limit (pounds)	CPUE (pounds per million feet)	Percent of allowable harvest	Potential effort (hours)	Minimum size limit	Harvest limit (pounds)	CPUE (fish per 100 hours)	CPUE (pounds per 100 hours)	Average size (pounds)	Percent of allowable harvest	Female spawning biomass	SSBR
Reference Period													
1996	0.000	-	-	0%	1,137,475	10	155,230	2.8	13.6	4.9	100%		
1997	0.000	-	-	0%	1,321,468	10	183,520	2.4	13.9	5.9	100%		
1998	0.000	-	-	0%	1,359,033	10	254,120	3.6	18.7	5.2	100%		
Rehabilitation Period (TAM = 40%)													
2001	Subsistence	4,265	na	1%	1,590,823	10	319,710	3.1	20.1	6.6	99%		
2002	Subsistence	4,172	na	1%	1,590,823	10	311,448	2.9	19.6	6.7	99%		
2003	Subsistence	4,000	na	1%	1,590,823	10	295,197	2.8	18.6	6.7	99%		
2004	Subsistence	3,842	na	1%	1,590,823	10	279,365	2.6	17.6	6.8	99%		
2005	Subsistence	3,657	na	1%	1,590,823	10	264,016	2.5	16.6	6.7	99%		
2006	Subsistence	3,548	na	1%	1,590,823	10	254,767	2.4	16.0	6.6	99%		
2007	Subsistence	3,426	na	1%	1,590,823	10	247,308	2.4	15.5	6.6	99%		
2008	Subsistence	3,358	na	1%	1,590,823	10	243,548	2.3	15.3	6.5	99%		
2009	Subsistence	3,314	na	1%	1,590,823	10	241,364	2.3	15.2	6.5	99%		
2010	Subsistence	3,290	na	1%	1,590,823	10	240,417	2.3	15.1	6.5	99%		
2011	Subsistence	3,276	na	1%	1,590,823	10	239,902	2.3	15.1	6.5	99%		
2012	Subsistence	3,271	na	1%	1,590,823	10	239,698	2.3	15.1	6.5	99%		
2013	Subsistence	3,270	na	1%	1,590,823	10	239,602	2.3	15.1	6.5	99%		
2014	Subsistence	3,270	na	1%	1,590,823	10	239,550	2.3	15.1	6.5	99%		
2015	Subsistence	3,269	na	1%	1,590,823	10	239,513	2.3	15.1	6.5	99%		
2016	Subsistence	3,269	na	1%	1,590,823	10	239,486	2.3	15.1	6.5	99%		
2017	Subsistence	3,269	na	1%	1,590,823	10	239,466	2.3	15.1	6.5	99%		
2018	Subsistence	3,269	na	1%	1,590,823	10	239,452	2.3	15.1	6.5	99%		
2019	Subsistence	3,269	na	1%	1,590,823	10	239,442	2.3	15.1	6.5	99%		
2020	Subsistence	3,269	na	1%	1,590,823	10	239,434	2.3	15.1	6.5	99%		

Appendix 1. Lake Trout, Lake Superior, MI-5

Scenario = Assume minimal subsistence fishing. Assume sport fishing effort increases by 20%.

45% SSBR = 0.37
2006 SSBR = 1.06
2020 SSBR = 1.06

	Commercial (Tribal)				Recreational (State)							Lake trout population	
Year	Effort limit (million feet)	Harvest limit (pounds)	CPUE (pounds per million feet)	Percent of allowable harvest	Potential effort (hours)	Minimum size limit	Harvest limit (pounds)	CPUE (fish per 100 hours)	CPUE (pounds per 100 hours)	Average size (pounds)	Percent of allowable harvest	Female spawning biomass	SSBR
Reference Period													
1996	0.000	-	-	-	61,750	10	55,409	18.1	89.7	4.9	100%		
1997	0.000	-	-	-	72,922	10	72,385	20.7	99.3	4.8	100%		
1998	0.000	-	-	-	54,612	10	57,867	21.6	106.0	4.9	100%		
Sustainable Management Period (TAM = 45%)													
2001	Subsistence	2,041	na	4%	75,714	10	51,914	17.7	68.6	3.9	96%		
2002	Subsistence	1,949	na	4%	75,714	10	50,787	17.6	67.1	3.8	96%		
2003	Subsistence	1,902	na	4%	75,714	10	51,977	18.1	68.6	3.8	96%		
2004	Subsistence	1,913	na	4%	75,714	10	52,448	18.2	69.3	3.8	96%		
2005	Subsistence	1,908	na	4%	75,714	10	51,677	17.9	68.3	3.8	96%		
2006	Subsistence	1,908	na	4%	75,714	10	51,174	17.7	67.6	3.8	96%		
2007	Subsistence	1,893	na	4%	75,714	10	50,873	17.6	67.2	3.8	96%		
2008	Subsistence	1,883	na	4%	75,714	10	50,750	17.6	67.0	3.8	96%		
2009	Subsistence	1,882	na	4%	75,714	10	50,713	17.6	67.0	3.8	96%		
2010	Subsistence	1,878	na	4%	75,714	10	50,647	17.6	66.9	3.8	96%		
2011	Subsistence	1,875	na	4%	75,714	10	50,614	17.6	66.8	3.8	96%		
2012	Subsistence	1,875	na	4%	75,714	10	50,614	17.6	66.8	3.8	96%		
2013	Subsistence	1,875	na	4%	75,714	10	50,614	17.6	66.8	3.8	96%		
2014	Subsistence	1,875	na	4%	75,714	10	50,614	17.6	66.8	3.8	96%		
2015	Subsistence	1,875	na	4%	75,714	10	50,614	17.6	66.8	3.8	96%		
2016	Subsistence	1,875	na	4%	75,714	10	50,614	17.6	66.8	3.8	96%		
2017	Subsistence	1,875	na	4%	75,714	10	50,614	17.6	66.8	3.8	96%		
2018	Subsistence	1,875	na	4%	75,714	10	50,614	17.6	66.8	3.8	96%		
2019	Subsistence	1,875	na	4%	75,714	10	50,614	17.6	66.8	3.8	96%		
2020	Subsistence	1,875	na	4%	75,714	10	50,614	17.6	66.8	3.8	96%		

Appendix 1. Lake Trout, Lake Superior, MI-6

Scenario =Effort-based, phase-in on commercial fishery from 2001 through 2005. Phase in a 22-in minimum size limit on sport fishery by 2005.
Adjust commercial and sport effort to achieve a 50/50 split from 2006 through 2020.

45% SSBR = 0.24
2006 SSBR = 0.24
2020 SSBR = 0.24

	Commercial (Tribal)				Recreational (State)							Lake trout population	
Year	Effort limit (million feet)	Harvest limit (pounds)	CPUE (pounds per million feet)	Percent of allowable harvest	Potential effort (hours)	Minimum size limit	Harvest limit (pounds)	CPUE (fish per 100 hours)	CPUE (pounds per 100 hours)	Average size (pounds)	Percent of allowable harvest	Female spawning biomass	SSBR
Reference Period													
1996	0.820	17,322	21,130	47%	35,370	10	19,256	12.0	54.4	4.5	53%		
1997	0.452	20,107	44,496	48%	42,493	10	21,819	11.6	51.3	4.4	52%		
1998	0.879	19,604	22,308	48%	38,157	10	21,439	12.6	56.2	4.4	52%		
Phase-in Period (Effort-Based for Commercial Fishery, Size Limit-Based for Recreational Fishery)													
2001	0.717	10,942	15,265	51%	46,408	20	10,458	5.8	22.5	3.9	49%		
2002	0.681	10,920	16,035	50%	46,408	20	10,752	6.1	23.2	3.8	50%		
2003	0.638	10,532	16,508	48%	46,408	20	11,203	6.3	24.1	3.8	52%		
2004	0.638	10,034	15,728	51%	46,408	22	9,705	5.4	20.9	3.9	49%		
2005	0.638	10,267	16,093	50%	46,408	22	10,142	5.6	21.9	3.9	50%		
Sustainable Management Period (TAM = 45%)													
2006	0.638	10,632	16,666	50%	46,408	22	10,442	5.8	22.5	3.9	50%		
2007	0.638	10,706	16,782	50%	46,408	22	10,644	5.9	22.9	3.9	50%		
2008	0.638	10,742	16,838	50%	46,408	22	10,758	5.9	23.2	3.9	50%		
2009	0.638	10,757	16,861	50%	46,408	22	10,805	5.9	23.3	3.9	50%		
2010	0.638	10,762	16,870	50%	46,408	22	10,826	6.0	23.3	3.9	50%		
2011	0.638	10,765	16,873	50%	46,408	22	10,835	6.0	23.3	3.9	50%		
2012	0.638	10,765	16,874	50%	46,408	22	10,838	6.0	23.4	3.9	50%		
2013	0.638	10,765	16,875	50%	46,408	22	10,839	6.0	23.4	3.9	50%		
2014	0.638	10,765	16,875	50%	46,408	22	10,839	6.0	23.4	3.9	50%		
2015	0.638	10,765	16,875	50%	46,408	22	10,839	6.0	23.4	3.9	50%		
2016	0.638	10,765	16,875	50%	46,408	22	10,839	6.0	23.4	3.9	50%		
2017	0.638	10,765	16,875	50%	46,408	22	10,839	6.0	23.4	3.9	50%		
2018	0.638	10,765	16,875	50%	46,408	22	10,839	6.0	23.4	3.9	50%		
2019	0.638	10,765	16,875	50%	46,408	22	10,839	6.0	23.4	3.9	50%		
2020	0.638	10,765	16,875	50%	46,408	22	10,839	6.0	23.4	3.9	50%		

Appendix 1. Lake Trout, Lake Superior, MI-7

Scenario =Assume commercia effort and sport effort increases by 20%.

45% SSBR = 0.20
2006 SSBR = 0.53
2020 SSBR = 0.53

	Commercial (Tribal)				Recreational (State)							Lake trout population	
Year	Effort limit (million feet)	Harvest limit (pounds)	CPUE (pounds per million feet)	Percent of allowable harvest	Potential effort (hours)	Minimum size limit	Harvest limit (pounds)	CPUE (fish per 100 hours)	CPUE (pounds per 100 hours)	Average size (pounds)	Percent of allowable harvest	Female spawning biomass	SSBR
Reference Period													
1996	1.047	23,450	22,403	69%	14,872	10	10,712	13.9	72.0	5.2	31%		
1997	3.400	41,499	12,207	78%	17,563	10	11,802	14.4	67.2	4.7	22%		
1998	3.010	27,299	9,069	74%	13,153	10	9,665	16.0	73.5	4.6	26%		
Sustainable Management Period (TAM = 45%)													
2001	2.983	48,045	16,108	69%	18,235	10	21,153	32.2	116.0	3.6	31%		
2002	2.983	51,486	17,262	73%	18,235	10	19,451	27.9	106.7	3.8	27%		
2003	2.983	54,064	18,126	72%	18,235	10	20,745	29.6	113.8	3.8	28%		
2004	2.983	55,313	18,545	72%	18,235	10	21,470	30.5	117.7	3.9	28%		
2005	2.983	55,700	18,674	72%	18,235	10	21,684	30.7	118.9	3.9	28%		
2006	2.983	55,934	18,753	72%	18,235	10	21,722	30.7	119.1	3.9	28%		
2007	2.983	55,986	18,770	72%	18,235	10	21,686	30.6	118.9	3.9	28%		
2008	2.983	55,935	18,753	72%	18,235	10	21,636	30.6	118.7	3.9	28%		
2009	2.983	55,931	18,752	72%	18,235	10	21,610	30.5	118.5	3.9	28%		
2010	2.983	55,827	18,717	72%	18,235	10	21,577	30.5	118.3	3.9	28%		
2011	2.983	55,773	18,699	72%	18,235	10	21,564	30.5	118.3	3.9	28%		
2012	2.983	55,773	18,699	72%	18,235	10	21,564	30.5	118.3	3.9	28%		
2013	2.983	55,773	18,699	72%	18,235	10	21,564	30.5	118.3	3.9	28%		
2014	2.983	55,773	18,699	72%	18,235	10	21,564	30.5	118.3	3.9	28%		
2015	2.983	55,773	18,699	72%	18,235	10	21,564	30.5	118.3	3.9	28%		
2016	2.983	55,773	18,699	72%	18,235	10	21,564	30.5	118.3	3.9	28%		
2017	2.983	55,773	18,699	72%	18,235	10	21,564	30.5	118.3	3.9	28%		
2018	2.983	55,773	18,699	72%	18,235	10	21,564	30.5	118.3	3.9	28%		
2019	2.983	55,773	18,699	72%	18,235	10	21,564	30.5	118.3	3.9	28%		
2020	2.983	55,773	18,699	72%	18,235	10	21,564	30.5	118.3	3.9	28%		

Appendix 2. Model estimates of harvest quota for lake whitefish by whitefish Management Unit in 1836 Treaty-ceded waters of the Great Lakes as used during the final stages of negotiations.

Total harvest (lb) for whitefish in Lake Michigan whitefish management units (WFMU) for 1999-2020 with target mortality rate used in the unit.

	Whitefish Management Unit								State share		
Year and TAM used[1]	WFM-00 65%	WFM-01 59%	WFM-02 65%	WFM-03 85%	WFM-04 65%	WFM-05 60%	WFM-06 65%	WFM-08 65%	WFM-01 200K or 10%	WFM-06 65 K or 30%	WFM-08 500 K or 22.5%
1999	1,420,742	477,853	211,960	1,223,717	332,021	170,017	140,976	416,853	47,785	42,293	93,792
2000	1,216,222	847,198	173,320	1,203,052	306,771	158,806	322,036	415,147	84,720	96,611	93,408
2001	1,323,355	659,310	143,700	2,397,616	577,825	258,313	551,763	2,551,846	65,931	165,529	574,165
2002	1,272,192	854,887	188,129	1,686,142	565,289	241,118	349,487	1,676,415	85,489	104,846	377,193
2003	1,250,747	960,488	225,231	1,524,416	558,347	233,733	249,959	1,312,155	96,049	74,988	295,235
2004	1,242,439	1,013,997	244,311	1,493,578	557,877	228,845	212,595	1,168,241	101,400	63,778	262,854
2005	1,239,875	1,040,501	251,961	1,488,065	558,631	226,743	185,382	1,113,252	104,050	55,615	250,482
2006	1,238,931	1,052,527	254,740	1,487,144	558,703	226,041	176,252	1,092,576	105,253	52,876	245,830
2007	1,238,597	1,057,639	255,718	1,486,992	558,715	225,646	173,390	1,085,045	105,764	52,017	244,135
2008	1,238,481	1,059,745	256,060	1,486,967	558,720	225,517	172,086	1,082,351	105,974	51,626	243,529
2009	1,238,440	1,060,612	256,180	1,486,963	558,721	225,454	171,622	1,081,402	106,061	51,487	243,316
2010	1,238,426	1,060,969	256,221	1,486,963	558,722	225,425	171,457	1,081,070	106,097	51,437	243,241
2011	1,238,421	1,061,116	256,236	1,486,963	558,722	225,413	171,399	1,080,954	106,112	51,420	243,215
2012	1,238,419	1,061,177	256,241	1,486,963	558,722	225,408	171,378	1,080,913	106,118	51,413	243,205
2013	1,238,418	1,061,202	256,243	1,486,963	558,722	225,406	171,371	1,080,899	106,120	51,411	243,202
2014	1,238,418	1,061,212	256,244	1,486,963	558,722	225,405	171,368	1,080,894	106,121	51,410	243,201
2015	1,238,418	1,061,216	256,244	1,486,963	558,722	225,405	171,367	1,080,892	106,122	51,410	243,201
2016	1,238,418	1,061,218	256,244	1,486,963	558,722	225,405	171,367	1,080,891	106,122	51,410	243,201
2017	1,238,418	1,061,219	256,244	1,486,963	558,722	225,405	171,367	1,080,891	106,122	51,410	243,201
2018	1,238,418	1,061,219	256,244	1,486,963	558,722	225,405	171,367	1,080,891	106,122	51,410	243,201
2019	1,238,418	1,061,219	256,244	1,486,963	558,722	225,405	171,367	1,080,891	106,122	51,410	243,201
2020	1,238,418	1,061,219	256,244	1,486,963	558,722	225,405	171,367	1,080,891	106,122	51,410	243,201

[1] Rule 4 is to increase total mortality on fully vulnerable age class to 65% (Z=1.05) by increasing fishing mortality unless resulting SPR_T (Spawning potential reduction target) is less than 0.20. If SPR_T is less than 0.20, find fishing multiplier that produces SPR = 0.20

Total harvest (lb) for whitefish in Lake Superior whitefish management units (WFMU) for 1999-2020 with target mortality rate used in the unit.

	Whitefish Management Unit					State share	
Year and	WFS-04	WFS-05	WFS-06	WFS-07	WFS-08	WFS-04	WFS-05
TAM used[1]	55%	45%	37%	50%	65%	25K or 10%	130K or16%
1999	88,491	292,112	43,385	537,861	84,866	8,849	46,738
2000	91,340	371,008	47,114	500,323	71,839	9,134	59,361
2001	377,091	933,264	51,617	494,649	91,306	37,709	149,322
2002	274,538	759,312	59,577	512,639	90,299	27,454	121,490
2003	218,928	649,591	63,922	524,201	88,975	21,893	103,935
2004	187,843	572,498	66,031	527,126	87,994	18,784	91,600
2005	170,289	520,142	65,871	528,551	87,782	17,029	83,223
2006	159,891	482,461	66,672	530,220	87,766	15,989	77,194
2007	153,869	455,046	67,823	531,271	87,749	15,387	72,807
2008	150,655	438,522	69,009	531,932	87,741	15,065	70,164
2009	148,957	428,585	70,084	532,349	87,739	14,896	68,574
2010	148,061	422,612	70,994	532,611	87,738	14,806	67,618
2011	147,589	419,021	71,731	532,776	87,737	14,759	67,043
2012	147,339	416,863	72,311	532,880	87,737	14,734	66,698
2013	147,208	415,565	72,759	532,945	87,737	14,721	66,490
2014	147,138	414,785	73,098	532,986	87,737	14,714	66,366
2015	147,102	414,316	73,352	533,012	87,737	14,710	66,291
2016	147,082	414,034	73,540	533,028	87,737	14,708	66,246
2017	147,072	413,865	73,678	533,038	87,737	14,707	66,218
2018	147,067	413,763	73,779	533,045	87,737	14,707	66,202
2019	147,064	413,702	73,852	533,049	87,737	14,706	66,192
2020	147,062	413,665	73,905	533,052	87,737	14,706	66,186

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Total harvest (lb) for whitefish in Lake Huron whitefish management units (WFMU) for 1999-2020 with target mortality rate used in the unit.

	Whitefish Management Unit					
Year and	WFH-01	WFH-02	WFH-03	WFH-04	WFH-05	WFH-06
TAM used[1]	65%	70%	No calc. done	65%	69%	No calc. done
1999	237,307	315,624		340,484	250,148	
2000	195,682	214,094		228,570	182,076	
2001	285,004	158,729		411,601	617,497	
2002	378,113	248,742		619,347	509,433	
2003	437,870	350,847		761,713	659,455	
2004	463,261	399,800		814,900	760,598	
2005	473,617	417,069		839,083	804,087	
2006	480,374	425,623		849,366	821,098	
2007	484,221	429,558		854,654	829,495	
2008	486,605	431,799		857,813	834,510	
2009	488,126	433,219		859,812	837,768	
2010	489,158	434,199		861,181	840,039	
2011	489,908	434,930		862,198	841,732	
2012	490,444	435,461		862,930	842,962	
2013	490,810	435,829		863,429	843,820	
2014	491,033	436,053		863,727	844,350	
2015	491,153	436,170		863,878	844,634	
2016	491,210	436,223		863,944	844,767	
2017	491,236	436,244		863,971	844,822	
2018	491,247	436,252		863,981	844,843	
2019	491,253	436,254		863,985	844,850	
2020	491,255	436,255		863,986	844,852	

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